STUDY OF SEPSIS WITH ACUTE KIDNEY INJURY

Dissertation Submitted to

The Tamil Nadu Dr.M.G.R Medical University

In the partial fulfilment of regulations

For the award of degree

MD DEGREE (GENERAL MEDICINE)

APRIL 2012

KILPAUK MEDICAL COLLEGE AND HOSPITAL,

CHENNAI-10

BONAFIDE CERTIFICATE

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ACKNOWLEDGEMENT

I would like to acknowledge **Prof. Dr.P.Ramakrishnan MD., DLO**, Dean kilpauk medical college and hospital for his support and guidance.

I am immensely grateful to, **Prof. Dr.N.Raghu MD**, HOD of medicine for his guidance and support for my study

I am thankful to **Prof. Dr.S.Ushalakshmi MD**, Unit chief for her support and guidance during the course of the study.

I will ever remain in gratitude to **Prof**. **Dr.B.Chellam MD**, former Unit Chief for not only helping in this dissertation, but also guiding through my post-graduate training programme.

I would like to show my gratitude to **Prof. Dr.Balaraman MD., DM** HOD of Department of Nephrology and **Prof. Dr.N.GopalaKrishnan MD., DM**, former HOD of Department of Nephrology for their supportiveness and guidance to my study work.

I am grateful to **Dr. I.Elango MD., DM**, Assistant professor in Department of Nephrology for his untiring effort and enthusiasm he has instilled on to me for this study work.

I am very grateful to **Dr. Shanthi MD** Medical registrar, **Dr.Radha MD** Assistant professor in Department of Medicine, **Dr. S.Rajasekar MD**, Former Assistant professor in Department of Medicine for their extensive support and guidance.

I am very thankful to **Dr. Bhaba DM** and **Dr.Vasudevan DM** for their support and guidance

I am also grateful to staff members of Department of Medicine and Department of Nephrology for their support

Finally, I would like to owe a lot to my patients for their support and without them this project would not be possible.

And above all I thank almighty for his gracefulness.

DECLARATION

I, **Dr.M.P.SENTHIL RAJA**, solemnly declare that the dissertation titled **A Study of sepsis with acute kidney injury** is prepared by me, This is submitted to the Tamil Nadu Dr.M.G.R. Medical University, Chennai in partial fulfillment of the requirement for the award of MD degree Branch I (General Medicine)

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Date:

CONTENT

SEPSIS WITH ACUTE KIDNEY INJURY

Abstract:

Sepsis is one of the most common causes of mortality in hospital and ICU admission cases. It is suggested that sepsis with AKI is associated with higher mortality and morbidity when compared with Non-septic Acute kidney injury cases. AKI is seen in 19% of moderate sepsis, 23% with severe sepsis and 51% with septic shock.so, with increasing severity of sepsis there is increase in incidence of AKI and increase in mortality. Mortality is higher in males, older age group associated with co-morbid illness. In our study, we study about the profile of AKI in septic cases. Sepsis is classified into moderate, severe and septic shock based on American college of thoracic society and its clinical outcomes are assed based on available parameters. AKI is divided into risk, injury, failure, loss and ESRD based on RIFLE classification and they are studied regarding the outcome, response to treatment, mortality and morbidity rates. Renal replacement therapy is the treatment of choice, when patient is anuric, raising azotaemia and resistant hypertension with pulmonary edema the ideal therapy is haemodialysis.

Keywords: Sepsis, Acute kidney injury, renal replacement therapy, RIFLE classofocation.

INTRODUCTION

Acute renal failure occurs in approximately 19 percent of Patients with moderate sepsis, 23 percent with severe sepsis, and 51 percent with septic shock when blood cultures are positive[1,2].

A progressive increase in the incidence of acute respiratory distress syndrome also occurs with moderate and severe sepsis and septic shock. In the United States, an estimated 700,000 cases of sepsis occur each year, resulting in more than 210,000 deaths; this number accounts for 10 percent of all deaths annually and exceeds the number of deaths due to myocardial infarction[3]. In India, studies in patients with sepsis with AKI are lacking. Majmudar et al, from india also demonstrated the same amount of incidence of sepsis in hospital admitted patients. The combination of acute renal failure and sepsis is associated with 70 percent mortality, as compared with 45 percent mortality among patients with acute renal failure alone.

Thus, the combination of sepsis and acute renal failure constitutes a particularly serious medical problem[4]. Substantial discovery has been made towards understanding the mechanisms whereby sepsis is associated with a high incidence of acute renal failure. The cytokine-mediated induction of nitric oxide synthesis that occurs in sepsis

decreases systemic vascular resistance[5]. This arterialvasodilatation predisposes patients with sepsis to acute renal failure, the need for mechanical ventilation, and ultimately, increased mortality.

Patients who have a combination of sepsis and acute renal failure may have some effects of systemic arterial vasodilatation, such as altered Starling forces in the capillaries, pulmonary edema, and hypoxia, a need for mechanical ventilation, acute respiratory distress syndrome, and multiple- organ dysfunction syndrome, which together may increase mortality to more than 80 percent[6,8].

In the background, the statistical data available on sepsis patients going in for acute kidney injury and then renal failure is entirely western data and there are not many studies done in india to prove their correlation and significance. There was an article in clinical journal of critical care medicine from AMRI hospitals, kolkatta stating about the emerging significance of sepsis with acute kidney injury and its increasing mortality. Still, there are no other significant studies done in India. Therefore, this study will throw some light on the sepsis patients going in for acute kidney injury and their various profile and clinical outcome of these patients.

REVIEW OF LITERATURE

Definition of sepsis:

Animals mount both local and systemic responses to microbes that traverse epithelial barriers and invade underlying tissues. Fever or hypothermia, leukocytosis or leukopenia, tachypnea, and tachycardia are the cardinal signs of the systemic response often called the *systemic inflammatory response syndrome* (SIRS)[11].

SIRS may have an infectious or a non-infectious aetiology. If infection is suspected or proven, a patient with SIRS is said to have *sepsis.* When sepsis is associated with dysfunction of organs distant from the site of infection, the patient has *severe sepsis*. Severe sepsis may be accompanied by hypotension or evidence of hypoperfusion. When hypotension cannot be corrected by infusing fluids, the diagnosis is *septic shock*.

Severe sepsis can be a response to any class of microorganism. Microbial invasion of the bloodstream is not essential for the development of severe sepsis, since local inflammation can also elicit distant organ dysfunction and hypotension. In fact, blood cultures yield bacteria or fungi in only ~20–40% of cases of severe sepsis and 40–70% of cases of septic shock. Individual gram-negative or gram-positive

bacteria account for ~70% of these isolates; the remainder are fungi or a mixture of microorganisms. In patients whose blood cultures are negative, the etiologic agent is often established by culture or microscopic examination of infected material from a local site. In some case series, a majority of patients with a clinical picture of severe sepsis or septic shock have had negative microbiologic data.

TYPE OF SEPSIS	CHARACTERISTICS
1.MODERATE SEPSIS	1.Temp >38deg cel or <36deg cel 2.heart rate>90/mt 3.RR>24/minute 4.wbc count >12000 or < 4000 Cell/cumm 5.immature band forms plus Evidence of infection
2.SEVERE SEPSIS	Sepsis + One organ dysfunction 1.CVS-- SBP <90mmhg or MAP<70mmhg responds to IVF 2.RENAL—UO<5ml/kg/hr despite IVF

	3.haematological—platelet count <80,000/l or 50% reduction from previous value for the past 3 days 4.unexplained metabolic acidosis 5.adequete fluid resuscitation
3.SEPTIC SHOCK	Sepsis with hypotension SBP<90mmhg or MAP<70mmhg despite adequate fluid resuscitation and inotropes.

Sepsis is a complication of an infectious process that is characterized by systemic inflammation with widespread tissue injury. The use of the word sepsis has long been a source of confusion because it is used interchangeably with the terms bacteremia, sepsis syndrome, severe sepsis, or even septic shock The expert panel of the ACCP/SCCM (American College of Chest Physicians/Society of Critical Care Medicine[11]) provided a conceptual and practical framework to define the systemic response to infection that falls under the general term of "sepsis"[11]. The panel classified septic patients into subgroups of increasing severity and mortality risk.

Acute renal injury:

Deterioration of renal function over days to weeks is called acute renal injury[69].

RIFLE CLASSIFICATION[10]:

	GFR criteria	**Urine output criteria**
Risk	Increased cr×1.5 or GFR>25% decrease or absolute increase in sr.cr of 0.3mg/dl	<5ml/kg/hr for 6hrs
Injury	Increased cr×2 or GFR >50% decrease	<5ml/kg/hr for12hrs
Failure	Increased cr×3 or GFR>75% decrease or sr cr>4mg/dl	<3ml/kg/hr for 12hrs or anuria for 12 hrs
Loss	Persistent AKI >4 Weeks	
End stage renal disease	Persistent renal failure for >3months	

Haemodynamics in sepsis patients:

The hemodynamic hallmark of sepsis is generalized arterial vasodilatation with an associated decrease in systemic vascular resistance. Arterial under filling due to arterial vasodilatation occurs in several clinical circumstances, including sepsis, and is associated with activation of the neurohumoral axis and an increase in cardiac output secondary to the decreased cardiac afterload. Activation of the sympathetic nervous system and the renin–angiotensin–aldosterone axis, the nonosmotic release of vasopressin, and an increase in cardiac output are essential in maintaining the integrity of the arterial circulation in patients with severe sepsis and septic shock but may lead to acute renal failure[8,9,10,11]. The arterial vasodilatation that accompanies sepsis is mediated, at least in part, by cytokines that up-regulate the expression of inducible nitric oxide synthase, as compared with constitutive endothelial nitric oxide synthase, is more profound and prolonged. Moreover, vascular resistance to the pressor response to norepinephrine and angiotensin II occurs during sepsis and is attributable in part to the potent vasodilatory effect of nitric oxide[12,14,15]. In addition, an increase in plasma concentrations of hydrogen ions and lactate and a decrease in ATP in vascular smooth-muscle cells during septic shock activate the

ATP-sensitive potassium channels (K ATP channel)[16,17]. The resultant potassium efflux through the K ATP channels causes hyperpolarization of the vascular smooth-muscle cells with closure of the vascular smooth-muscle cells with closure of the voltage-gated calcium channels in the membrane. Since the vasoconstrictor effects of norepinephrine[12] and angiotensin II[5] depend on open calcium channels, vascular resistance to these pressor hormones can occur along with lactic acidosis in patients with sepsis. Furthermore, the high endogenous levels of these vasoactive hormones during sepsis may be associated with down-regulation of their receptors which would result in a lessening of their effects on the vasculature[12,13].

Effects of systemic arterial vasodilation on body fluid volume and Starling forces:

The difference between the oncotic and hydrostatic pressures within the vasculature and interstitium (Starling forces) determines whether plasma water remains within the vasculature or leaks out into the interstitium. Experimental studies in rats have examined the effect of arterial vasodilatation on Starling forces, albumin distribution, and body-fluid volume in normal animals[30]. The administration of the potent arterial vasodilator minoxidil was shown to cause sodium and water

retention with resultant expansion of plasma and interstitial volume. With the use of Guyton's subcutaneous capsule, which is able to measure interstitial pressure, arterial vasodilatation in a rat model was shown to reverse the normally negative pressure within the interstitium. Moreover, during intravenous saline loading, interstitial pressure increased in animals without vasodilatation, whereas the elevated interstitial pressure in the animals that had vasodilatation did not increase further. The fall in interstitial pressure that occurred with the intravenous administration of hyper-oncotic albumin in the normal animals did not occur in the animals with vasodilatation. This latter effect may be due to the increased distribution of albumin within the interstitial space that occurs with arterial vasodilatation. The pulmonary bed is particularly prone to collect interstitial fluid in this situation. If applied to humans, these findings would indicate that patients with sepsis who have vasodilatation are susceptible to noncardiogenic pulmonary edema.

Neveu et al[6] performed a prospective study involving 345 patients who had acute renal failure with or without sepsis. The most dramatic differences were the increased requirement for mechanical ventilation (70 percent vs. 47 percent, P=0.001) and the higher mortality (74.5

percent vs. 45.2 percent, P<0.001) in the patients with sepsis. There are sequences of events that can occur with overly aggressive fluid administration, which results in increases in interstitial volume in patients with sepsis and acute renal failure who have vasodilatation.

Sepsis and endotoxemia:

There is experimental evidence that in early sepsis related acute renal failure, the predominant pathogenetic factor is renal vasoconstriction with intact tubular function, as demonstrated by increased reabsorption of tubular sodium and water. Thus, intervention at this early stage may prevent progression to acute tubular necrosis. For example, if endotoxin is infused into a conscious-rat model, the early events include a fractional excretion of sodium of less than 1 percent, indicating good tubular function. Fractional excretion of sodium is calculated as [(urine sodium¬plasma creatinine) ÷ (plasma sodium¬urine creatinine)] ¬100. This level of fractional excretion may result in prerenal azotemia[22,23]. If this prerenal azotemic state is persistent, the fractional excretion of sodium increases, indicating tubular dysfunction that may progress to established acute tubular necrosis. Although the activation of the neurohumoral axis during the arterial vasodilatation that occurs in sepsis is critical in maintaining

arterial circulatory integrity it is associated with renal vasoconstriction[31]. Plasma concentrations of catecholamines and activation of the renin–angiotensin–aldosterone system are known to be heightened in cases of sepsis[10] and septic shock[11]. This pattern of hormonal activation has been observed in a normotensive murine model of endotoxemia induced with lipopolysaccharide (5 mg per kilogram of body weight)[33]. In this same model, renal denervation afforded considerable protection against the decrease in the glomerular filtration rate during the initial 16 hours of endotoxemia. Such studies indicate that the effects of these vasoactive hormones on the kidney are, at least in some measure, neurally mediated and may contribute to the acute renal failure seen in cases of sepsis.

Another pressor hormone that has been observed to be elevated in sepsis is endothelin, a potent vasoconstrictor. Renal vasoconstriction in sepsis seems to be due, at least in part, to the ability of tumor necrosis factor to release endothelin[34]. Indeed, an intrarenal injection of antiserum to endothelin- 1 in a rat model was capable of reversing the decrease in the glomerular filtration rate induced by endotoxin. During endotoxemia, endothelin may also cause an endotoxemia, generalized leakage of fluid from the capillaries and thereby diminish plasma volume[36]. The vasodilatory effect of constitutive endothelial nitric oxide

Synthase within the kidney might be expected to lessen the renal vasoconstriction induced by norepinephrine, angiotensin II, and endothelin during sepsis. However, the results of in vitro studies showed that the increase in the plasma nitric oxide concentration stimulated by inducible nitric oxide synthase during endotoxemia down-regulated endothelial nitric oxide synthase within the kidney[37].

When cytokines activated inducible nitric oxide synthase, however, not only did the plasma nitric oxide concentration increase, but also the expression of inducible nitric oxide synthase increased in the renal cortex[38]. In association with this increased expression of inducible nitric oxide synthase, a progressive increase in cGMP in the renal cortex occurred during the initial 16 hours after exposure to endotoxin. At 24 hours, however, the plasma nitric oxide concentration remained high, though renal cGMP had decreased. Since cGMP is the secondary messenger for nitric oxide–mediated arterial vasodilatation, the down regulation of this enzyme at 24 hours may also contribute to renal vasoconstriction during sepsis.

Endothelial damage occurs during sepsis and may be associated with microthrombi and an increased concentration of von Willebrand factor in the circulation[39]. Sepsis-related impairment of the endothelium

may also attenuate or abolish the normal effect of endothelial nitric oxide synthase in the kidney to counteract the vasoconstrictor effects of norepinephrine, endothelin, and angiotensin II. The study of knockout mice, in which the expression of either endothelial nitric oxide synthase or inducible nitric oxide synthase has been ablated, has been helpful in elucidating the importance of endothelial damage during sepsis. Since there is no specific inhibitor of endothelial nitric oxide synthase, the effect of endotoxin (lipopolysaccharide) was tested in endothelial nitric oxide synthase–knockout mice, which have a significant increase in blood pressure and renal vascular resistance as compared with normal (control) mice. A small dose of endotoxin, which did not alter the glomerular filtration rate in the control mice, caused a profound decrease in the glomerular filtration rate in these knockout mice[40].

Endotoxemia:

Tumor Necrosis Factor and Reactive Oxygen Species

Studies have also been undertaken in inducible nitric oxide synthase–knockout mice to determine the role of the high plasma nitric oxide concentration in the acute renal failure that is associated with endotoxemia. A dose of endotoxin (lipopolysaccharide) of 5 mg per kilogram causes a large and progressive rise in the plasma nitric oxide

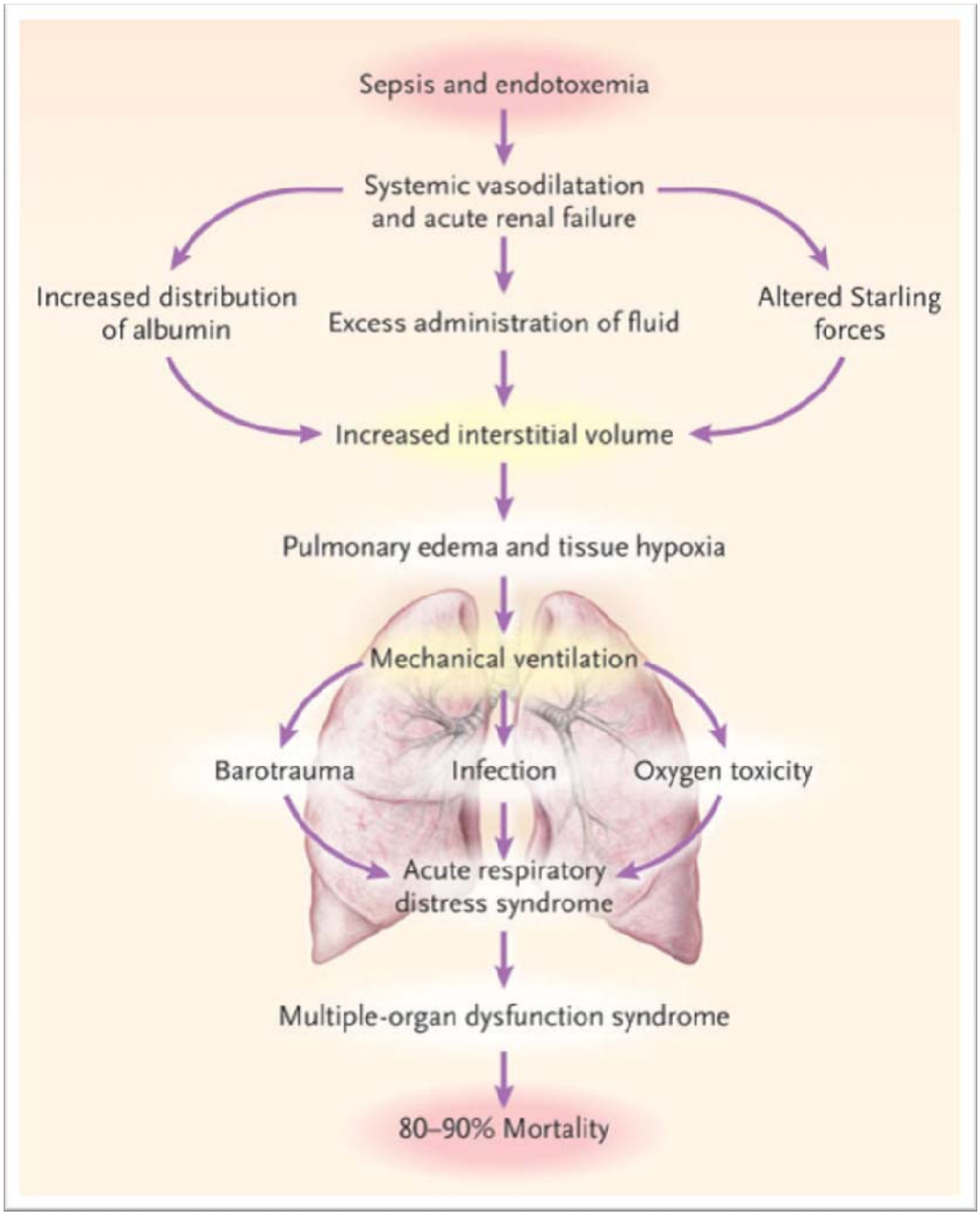
concentration in the normotensive mouse model by means of inducible nitric oxide synthase. However, in mice in which inducible nitric oxide synthase is ablated, this same dose of endotoxin fails to cause an increase in plasma nitric oxide. Nevertheless, these knockout mice still have a decrease in the glomerular filtration rate after receiving endotoxin, suggesting that cytokines such as tumor necrosis factor can cause renal vasoconstriction even in the absence of inducible nitric oxide synthase[38]. The role of tumor necrosis factor in endotoxin-related acute renal failure has been tested in both animal and human studies.

Endotoxemia is known to be associated with the generation of oxygen radicals and thus may contribute to the early vasoconstrictor phase of acute renal failure. Endogenous scavengers of reactive oxygen species can attenuate renal tubular injury or renal vascular injury (or both) that is caused by re- active oxygen species during endotoxemia[41,42]. However, the levels of the messenger RNA and protein of the endogenous scavenger extracellular superoxide dismutase, which is found predominantly in blood vessels and the kidney, have been noted to be decreased in mice during endotoxemia.

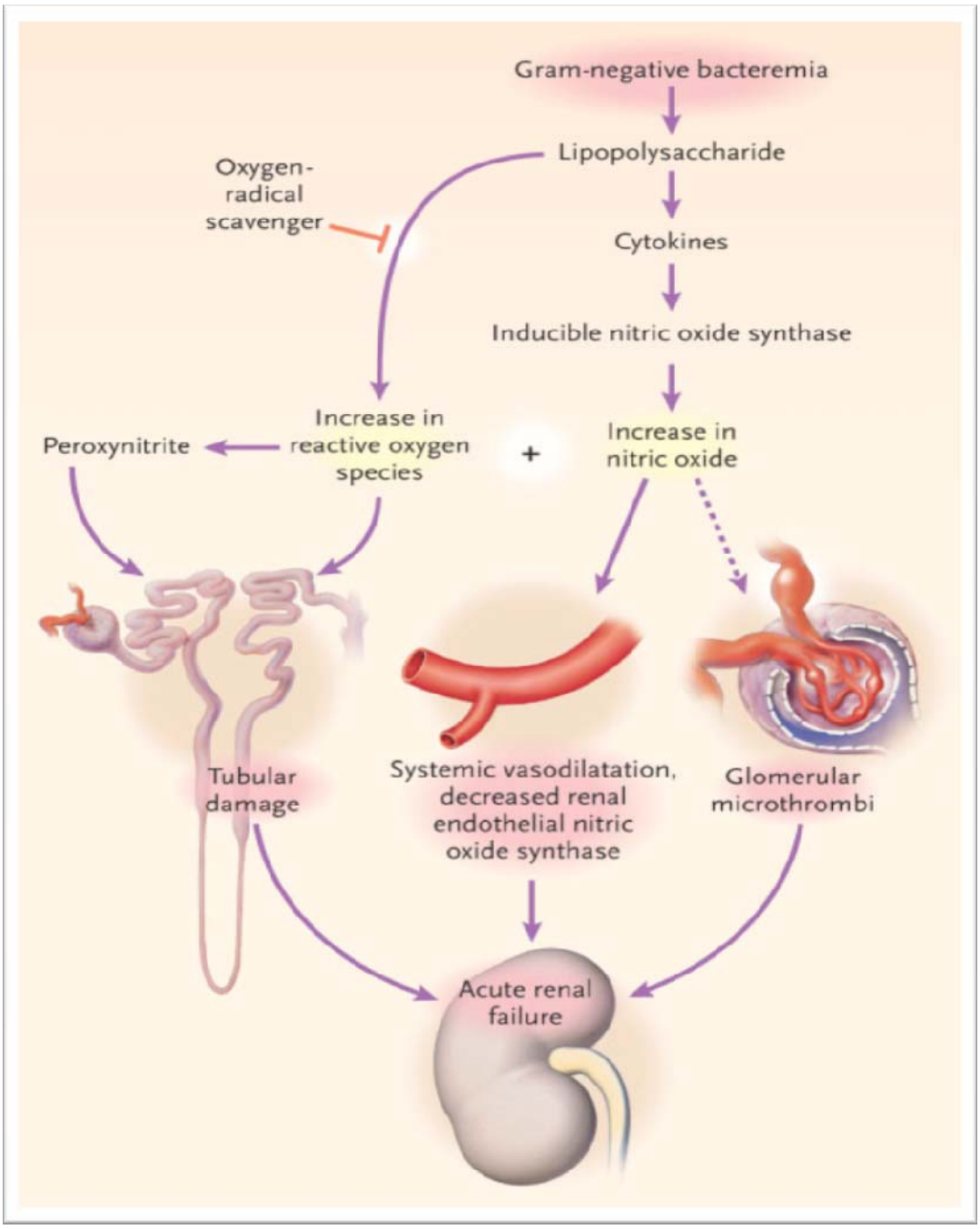
Oxygen radicals also scavenge nitric oxide to produce peroxynitrite, an injurious reactive oxygen species. Furthermore, the

decrease in endothelial nitric oxide synthase in the kidney when there is oxidant-related endothelial damage may contribute to the early vasoconstrictor phase of acute renal failure. Sepsis and endotoxemia with acute renal failure can lead to early noncardiogenic pulmonary edema, hypoxia and the need for mechanical ventilation. With prolonged ventilatory support, acute respiratory distress syndrome, multiple-organ dysfunction syndrome, and an extremely high mortality can occur. The goal is to intervene early to prevent excessive fluid administration and to lessen fluid overload by hemofiltration. This will prevent the need for long-term mechanical ventilation that could lead to damage to the pulmonary capillaries. It could also prevent tissue hypoxia and the acute respiratory distress syndrome and reduce the risk of death[41,43].

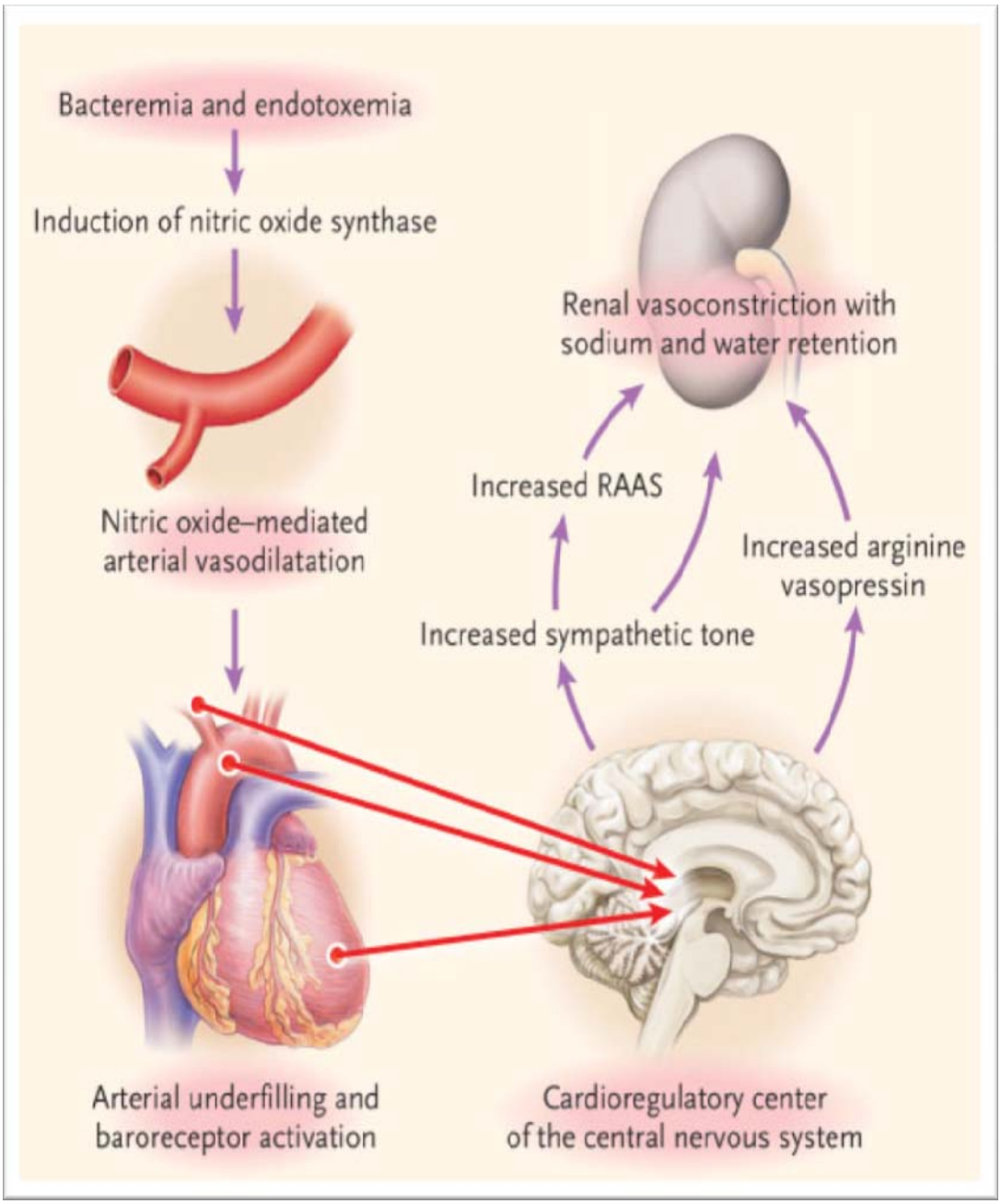
SEPSIS AND ENDOTOXEMIA



TUMOUR NECROSIS FACTOR AND OXYGEN REACTIVE SPECIES



ENDOTOXEMIA



Endotoxemia stimulates the induction of nitric oxide synthase, which leads to nitric oxide–mediated arterial vasodilation.The resultant arterial underfilling is sensed by the baroreceptors and results in an increase in sympathetic outflow and the release of arginine vasopressin from the central nervous system, with activation of the renin–angiotensin–aldosterone system (RAAS)[37]. These increases in renal sympathetic and angiotensin activities lead to vasoconstriction with sodium and water retention and a predisposition to acute renal failure.

Cytokines, Chemokines, and Adhesion Molecules:

The early vasoconstrictor phase of acute renal failure during endotoxemia may be followed by a pro-inflammatory phase, although there is probably an overlap in these processes. It is known that caspase activates both interleukin-1 and interleukin-18 cytokines, and the resultant up-regulation of adhesion molecules contributes to neutrophil infiltration during endotoxemia. The importance of caspase in endotoxemia has been underscored by the observation that caspase-1–knockout mice are protected against renal failure that is induced by either ischemia[45] or endotoxemia[46]. Several chemokines are also expressed during endotoxemia in association with neutrophil and macrophage infiltration into the glomeruli and interstitium. The complex

composed of a lipopolysaccharide and the lipopolysaccharide-binding protein activates the membrane-CD14 and toll-like receptors on cells, which up-regulate nuclear factor*k* B (NF*k* B), a nuclear transcription factor for the promoters of multiple cytokines, chemokines, and adhesion molecules[47]. Activation of NF*k* B may therefore be a critical factor in the proinflammatory phase that involves a cytokine, chemokine, and adhesion molecule "storm," which leads to acute renal failure and an increased death rate. Blocking agents for NF*k* B exist that could protect against endotoxemia better than targeting any individual cytokine, chemokine, or adhesion molecule[48]. These substances need to be studied both in experimental models and in clinical studies in humans with concurrent sepsis and acute renal failure.

Complement pathways are activated during sepsis by bacterial products such as lipopolysaccharide, by bacterial products such as lipopolysaccharide, C-reactive protein, and other stimuli. Complement C5a that is generated during sepsis seems to have procoagulant properties, and blocking C5a and C5a receptor in a rodent model of sepsis has been shown to improve survival[49,50,51].

Disseminated intravascular coagulation:

Sepsis affects the expression of complement, coagulation, and the fibrinolytic cascade. Sepsis can be viewed as a procoagulant state that can lead to disseminated intravascular coagulation with consumptive coagulopathy, thrombosis, and ultimately haemorrhage.

Disseminated intravascular coagulation has been associated with glomerular microthrombi and acute renal failure[54]. Prospective, randomized trials have been undertaken to evaluate methods of intervening in the procoagulant process associated with sepsis. A major prospective, randomized study, the PROWESS (Recombinant Human Activated Protein C Worldwide Evaluation in Severe Sepsis) trial, showed that recombinant human activated protein C (drotrecogin alfa) significantly improved survival in patients with severe sepsis, as compared with those given placebo (75.3 percent vs. 68.3 percent, P=0.006)[55].

Early intervention is always better:

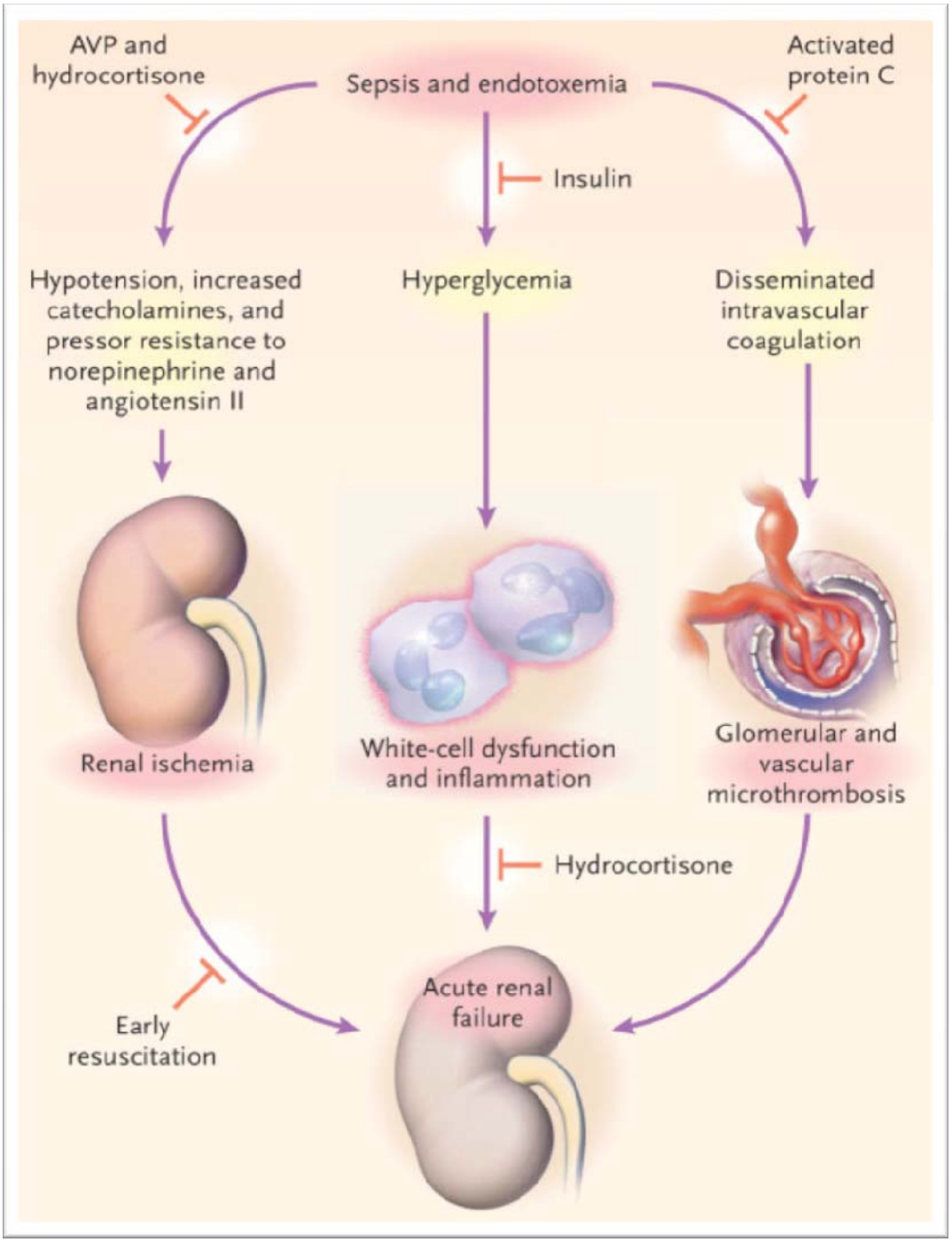
Since the early vasoconstrictor phase of sepsis and acute renal failure is potentially reversible, it should be an optimal time for intervention. However, clinical studies performed in patients up to 72 hours after admission to the intensive care unit, in which attempts were

made to optimize hemodynamics and monitor the patients with a pulmonary-artery catheter, not only were negative[56,57,58,59] but showed increased mortality among patients with sepsis. In contrast, a randomized study of 263 patients with a mean serum creatinine concentration of 2.6 mg per deciliter (230 μmol per liter) on admission to the emergency department showed that early goal directed therapy during the first six hours after admission was effective[60]. The central venous oxygen saturation was continuously monitored as goal directed therapy was instituted; in patients assigned to such interventions, the multiorgan dysfunction score decreased significantly and in-hospital mortality decreased (30.5 percent, as compared with 46.5 percent in the control patients, who received standard care; P=0.009). The goal-directed approach included early volume expansion and administration of vasopressors to maintain mean blood pressure at or above 65 mm Hg and transfusion of red cells to increase the hematocrit to 30 percent or more if central venous oxygen saturation was less than 70 percent. If these interventions failed to increase central venous oxygen saturation to greater than 70 percent, then therapy with dobutamine was instituted.

Hyperglycaemia and insulin:

Hyperglycemia impairs the function of leukocytes and macrophages. A randomized study of 1548 patients compared the use of insulin to control blood glucose levels tightly (maintaining blood glucose levels between 80 and 110 mg per deciliter [4.4 and 6.1 mmol per liter]) with conventional treatment (the use of insulin only if the blood glucose levels exceeded 215 mg per deciliter [11.9 mmol per liter], with the aim of maintaining glucose levels between 180 and 220 mg per deciliter [10.0 and 12.2 mmol per liter][61]. The group assigned to tight control of blood glucose levels showed a decrease in mortality in the intensive care unit as compared with the group receiving conventional treatment (4.6 percent vs. 8 percent, $P<0.04$), a 46 percent decrease in positive blood cultures, and a 41 percent decrease in acute renal failure requiring dialysis or hemofiltration. Multiple-organ failure with a proven focus of sepsis was also decreased (8 cases vs. 33 cases, $P=0.02$). Recent studies further support the importance of controlling blood glucose in critically ill patients but suggest a less stringent goal of maintaining blood glucose at a level of 145 mg per deciliter (8.0 mmol per liter) or less[62]. Arginine vasopressin (AVP) and hydrocortisone (50 mg every six hours for seven days) may be effective therapy for pressor-resistant hypotension and may decrease the likelihood of acute renal failure during septic shock.

DISSEMINATED INTRAVASCULAR COAGULATION:



Early directed resuscitation of patients with sepsis may prevent the progression from prerenal azotemia to acute tubular necrosis. Maintenance of blood glucose levels below 145 mg per deciliter (8.0 mmol per liter) may decrease the incidence of acute renal failure, multiple-organ dysfunction syndrome, and death. Finally, activated protein C can decrease disseminated intravascular coagulation with glomerular and microvascular thrombi and thereby decrease mortality. T bars indicate inhibition.

Role of glucocorticoids:

Glucocorticoids have been known to enhance the pressor effects of catecholamines, but older studies in which septic shock was treated with large doses of glucocorticoid hormones for a short period of time did not show any benefit[63,64]. However, a recent study[65] in patients with septic shock showed that patients without a response to corticotropin (as defined by a rise in plasma free cortisol of less than 9 μg per deciliter at 30 or 60 minutes) who were treated for 7 days with intravenous boluses of 50 mg of hydrocortisone every 6 hours plus daily oral fludrocortisone (a 50-μg tablet) had a decrease in mortality at 28 days as compared with the placebo group (63 percent vs. 53 percent, P=0.02). In this randomized study, 229 of the 299 patients with septic shock who were

enrolled were classified as not having a response. There was no difference in mortality among the 70 patients with a response to the short corticotropin study. Withdrawal of vasopressors was also significantly better at 28 days in those without a response (40 percent vs. 57 percent, P<0.001)[65]. Although this study did not report renal function results, it is known that septic shock is associated with acute renal failure in 38 percent of patients with negative cultures and 51 percent of patients with positive cultures[2].

Role of mechanical ventilation:

Studies show that the longer the duration of mechanical ventilation, the higher the mortality in patients with sepsis and acute renal failure.

One study showed that daily interruption of a continuous infusion of sedatives in critically ill patients who were undergoing mechanical ventilation shortened the time needed on the ventilator (7.3 vs. 4.9 days, P=0.004) and time in the intensive care unit (9.9 vs. 6.4 days, P=0.02).

Renal replacement therapy:

Patients with sepsis and acute renal failure are hypercatabolic. Studies suggesting that increased doses of dialysis improve survival in patients who are hypercatabolic and have acute renal failure are persuasive. For example, survival was markedly improved with aggressive hemodialysis as compared with peritoneal dialysis in patients who had heatstroke, rhabdomyolysis, and acute renal failure. Hemofiltration has been shown to produce better survival rates than peritoneal dialysis in patients with acute renal failure associated with malaria and other infections. A recent study showed that daily hemodialysis as compared with alternate-day hemodialysis was associated with less systemic inflammatory response syndrome or sepsis (22 percent vs. 46 percent, P=0.005), lower mortality (28 percent acute renal failure (mean [±SD], 9±2 vs. 16±6 days; P=0.001).

Continuous renal-replacement therapy has increasingly been used to treat acute renal failure. A randomized study using continuous venovenous hemofiltration suggested that the ultrafiltration rate of 35 or 45 ml per kilogram per hour as compared with 20 ml per kilogram per hour improves survival in acute renal failure (P<0.001)[70]. Moreover, in patients with sepsis-related acute renal failure, better survival was

observed with an ultrafiltration rate of 45 ml per kilogram per hour than with a rate of 35 mg per kilogram per hour. Meta-analysis of hemodialysis as compared with continuous renal-replacement therapy in acute renal failure, however, has not yet shown an advantage for either mode of renal replacement therapy[71]. The benefit of the removal of cytokines by continuous renal-replacement therapy also remains to be proven as a method for improving survival in patients with sepsis and acute renal failure.

AIMS AND OBJECTIVES

To study profile of sepsis with acute kidney injury.

To study the relationship between age, sex and its clinical outcome.

To study about the influence of renal replacement therapy employed.

To assess the mortality rates of septic patients.

MATERIALS AND METHODS

Place : Department of Medicine, Kilpauk medical college and Hospital And Department of Nephrology, Kilpauk medical college and Hospital

Design : Observational study

Duration : November 2010- November2011

Sample size: 50 patients

Inclusion criteria:

All patients with evidence of sepsis and acute kidney injury above 13yrs of age, both male and female

Sepsis criteria:

Sepsis- Body temperature > 38° Celsius or < 36° Celsius

Heart rate > 90 beats/minute

Respiratory rate > 24/minute

Immature band forms

Plus

Evidence of infection by culture sensitivity, gram stain

Severe sepsis - Sepsis **plus** one organ dysfunction

1. *Cardiovascular*: arterial systolic blood pressure 90mmhg or mean arterial pressure 70mmhg that responds to administration of intravenous fluids.

2. *Renal:* urine output < 0.5ml/kg/hour for 1 hour despite adequate fluid resuscitation.

3. *Respiratory*: Pao2/Fio2 < 250 or if the lung is the only dysfunctional organ < 200

4. *Hematologic:* platelet count < 80,000/l or 50% decrease in platelet count from the highest value recorded over previous 3 days.

5. *Unexplained metabolic acidosis:* A pH 7.30 or base deficit 5.0 mEq/l and plasma lactate level > 1.5 time's upper limit of normal for reporting lab.

6. *Adequate fluid resuscitation:* pulmonary artery edge pressure 12 mmHg or central venous pressure 8 mmHg.

Septic shock:

Sepsis with hypotension(arterial blood pressure < 90 mmHg systolic or 40mmHg less than patients normal blood pressure) for at

least 1 hour despite adequate fluid resuscitation or need for vassopressors to maintain blood pressure 90 mmHg or mean arterial pressure 70mmHg.

Acute kidney injury criteria:

RIFLE CRITERIA:

	GFR criteria	Urine output criteria
Risk	Increased cr×1.5 or GFR>25% decrease or absolute increase in sr.cr of 0.3mg/dl	<5ml/kg/hr for 6hrs
Injury	Increased cr×2 or GFR >50% decrease	<5ml/kg/hr×12hrs
Failure	Increased cr×3 or GFR>75% decrease or sr cr>4mg/dl	<3ml/kg/hr×12hrs or anuria for 12 hrs
Loss	Persistent AKI >4 Weeks	
ESRD	Persistent renal failure >3months	

Exclusion criteria:

Patients with chronic kidney disease

Procedure of the study:

Patients admitted in medical, surgical, obstetrics and gynaecology ward and nephrology ward with clear evidence of sepsis and acute kidney injury assessed by raised titres of serum creatinine and reduced urine output as per RIFLE CRITERIA. Septic patients are classified into three groups as moderate sepsis, severe sepsis and septic shock as per classification given American thoracic society. Detailed and meticulous history has been taken from patients and from attenders. A through clinical examination is also carried out. The following parameters were evaluated from the recruited patients

1. Complete blood count with peripheral smear
2. Urine routine
3. Temperature recorded using mercury thermometer
4. Serial values of serum urea and serum creatinine
5. Serum sodium and serum potassium
6. Urine output and input chart

7. Chest x-ray pa view

8. Urine spot protein- creatinine ratio

9. Ultrasound abdomen and pelvis

10. Urine/blood/sputum culture and sensitivity

11. CSF analysis, if needed

12. Arterial blood gas analysis

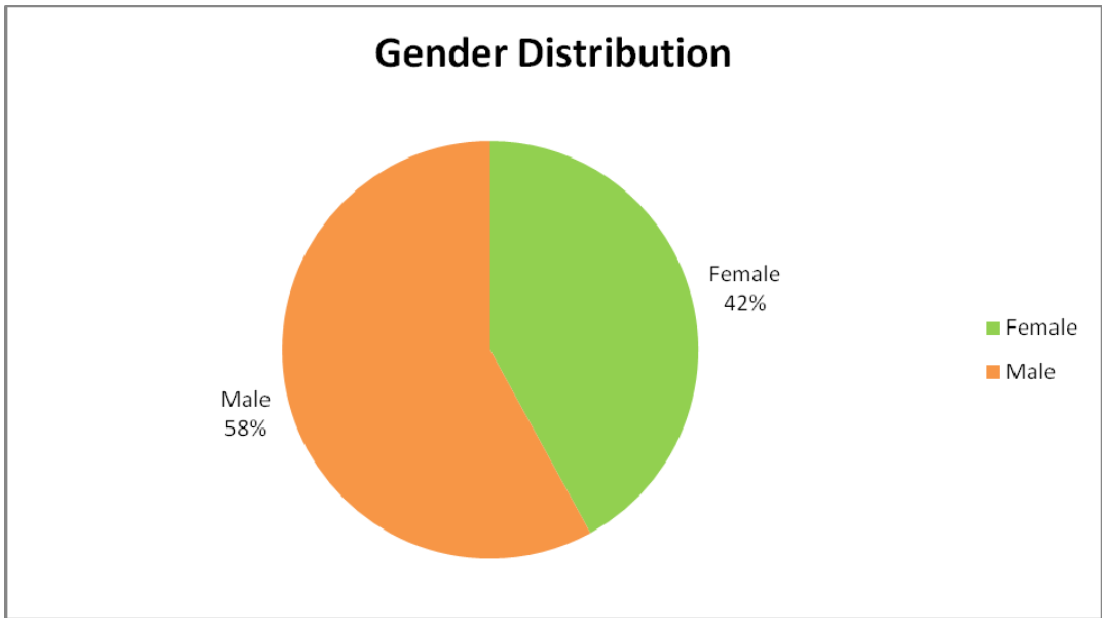
13. 12-lead ECG

DATA ANALYSIS

SEX DISTRIBUTION:

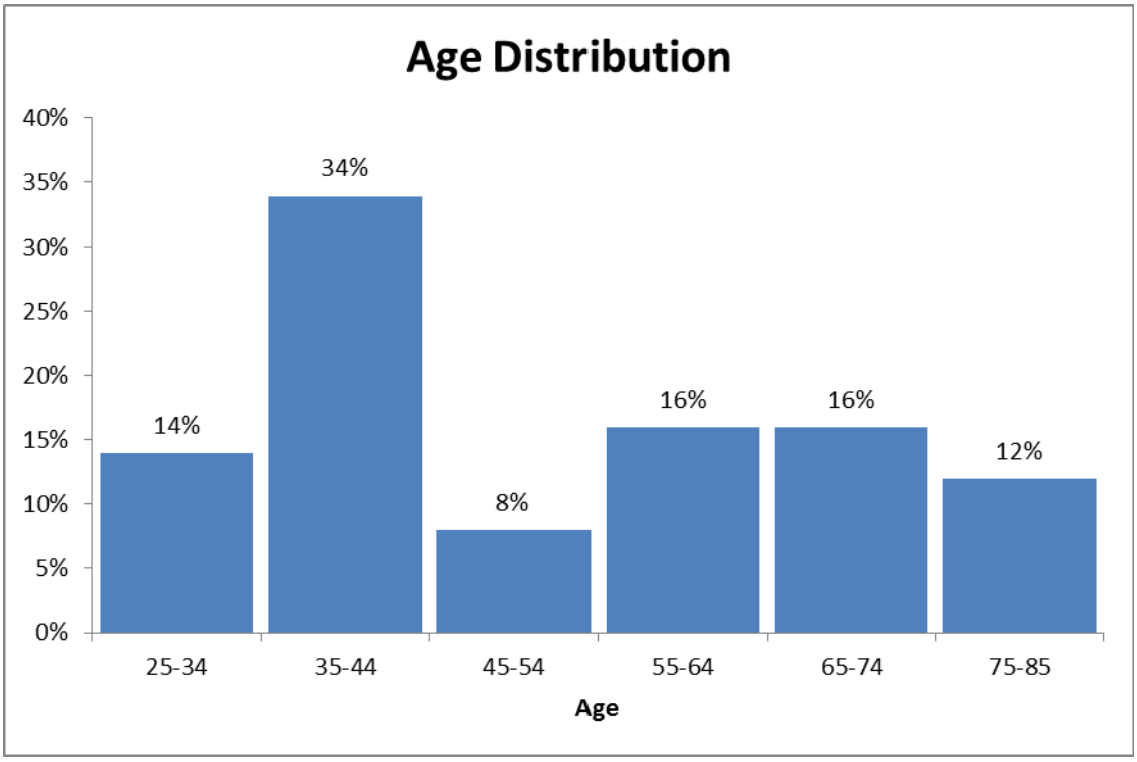
Sex	No of cases	Percentage
Male	29	58%
Female	21	42%
Total	50	100%

As per this table, there are 21 cases of female patients (42%) and 29 cases of male patients (58%).



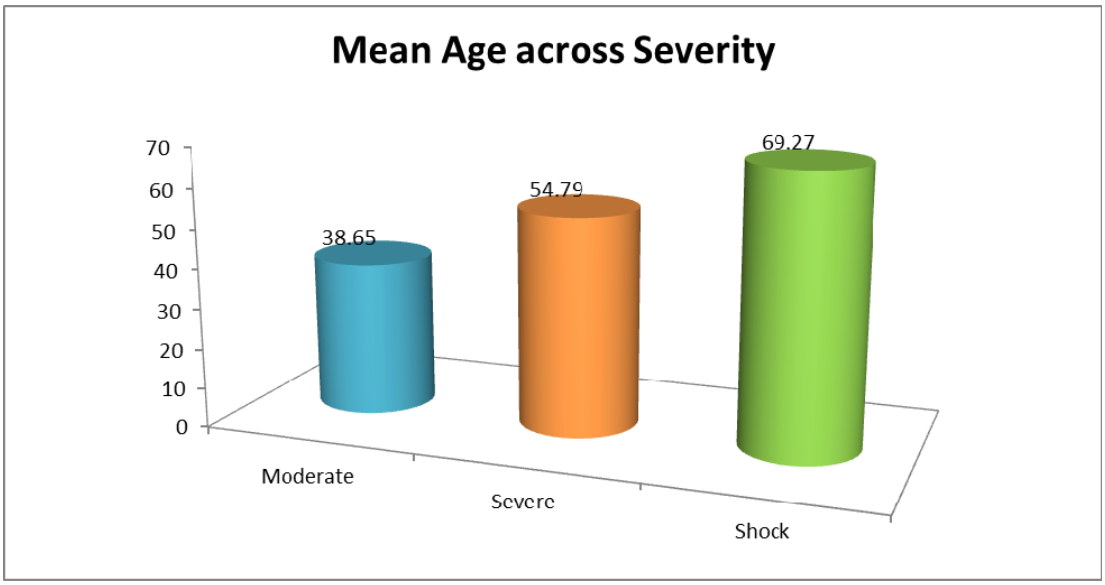
AGE DISTRIBUTION:

Age	Frequency	Percentage
25-34	7	14%
35-44	17	34%
45-54	4	8%
55-64	8	16%
65-74	8	16%
75-85	6	12%



CORRELATION BETWEEN AGE AND SEVERITY OF SEPSIS:

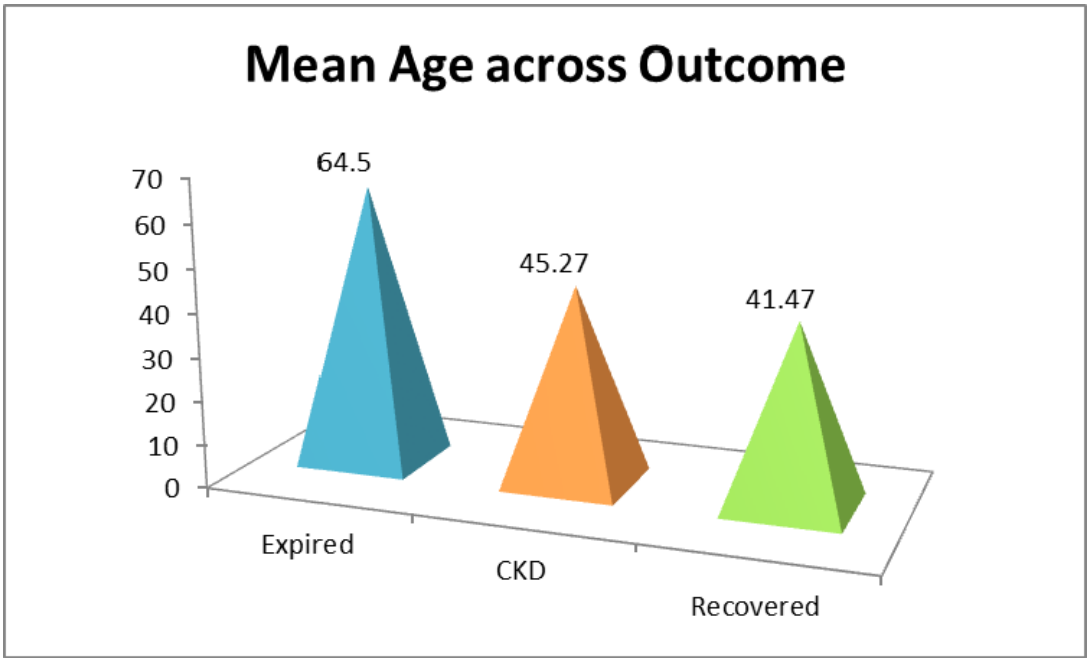
Severity of sepsis	No of cases	Mean Age
Moderate	20	38.65
Severe	19	54.79
Shock	11	69.27
Total	50	51.52



As per this table, 20 cases of moderate sepsis with mean age of 38.6, 19 cases of severe sepsis with mean age of 54.7 and 11 cases of septic shock with mean age of 69.2. With increasing age there increasing severity of sepsis (p value <0.001)

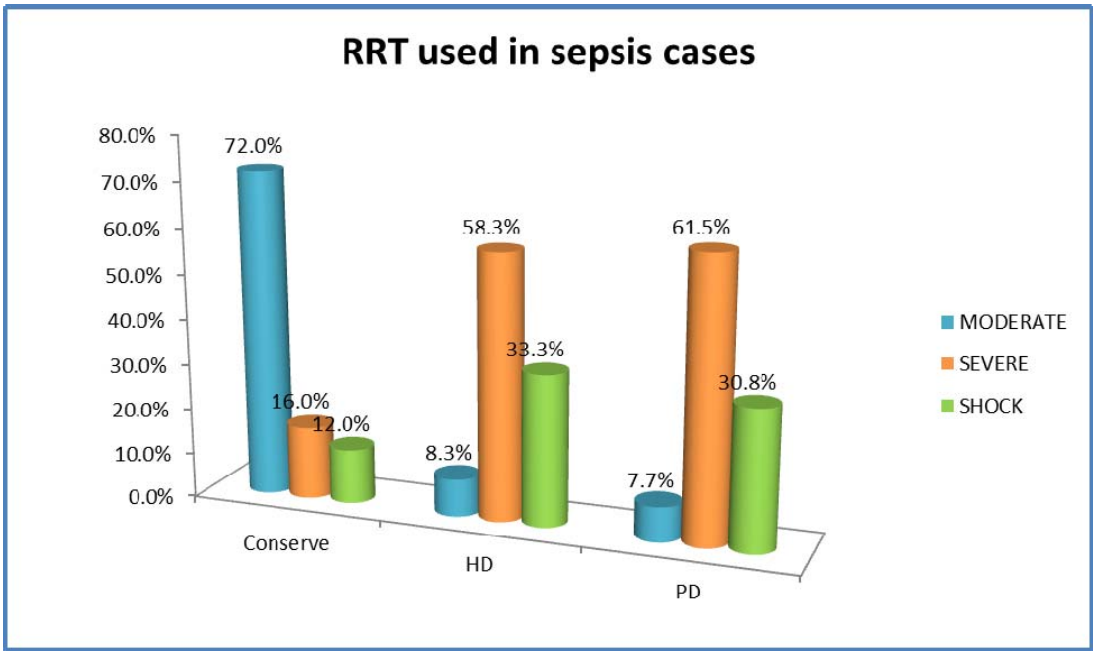
AGE VERSUS THE OUTCOME:

Outcome	No of cases	Mean Age
Expired	20	64.5
Chronic kidney disease	11	45.27
Recovered	19	41.47
Total	50	51.52



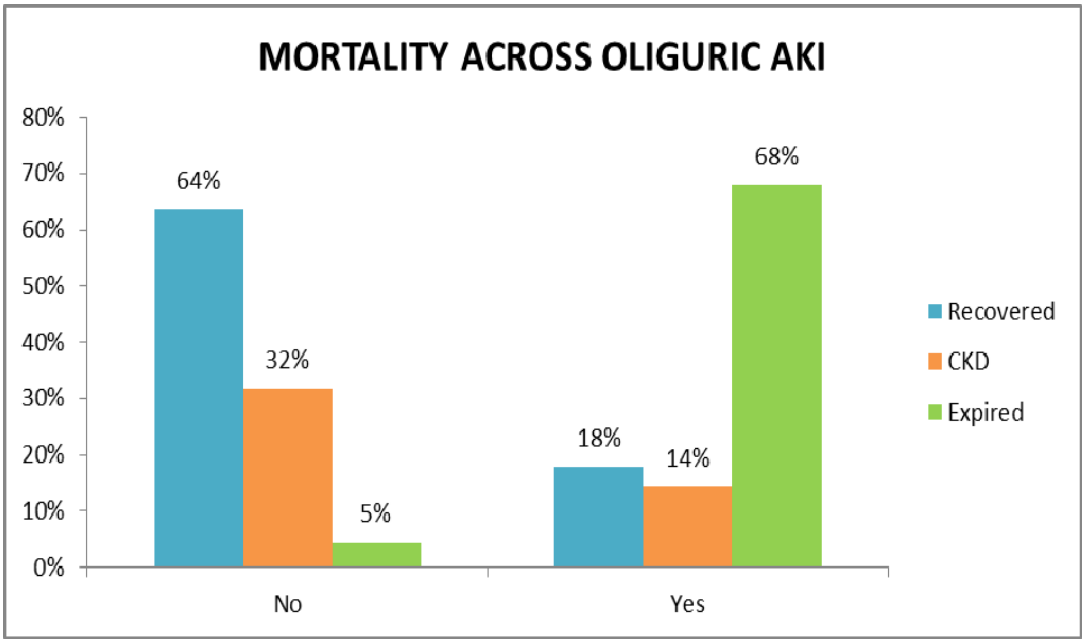
RENAL REPLACEMENT THERAPY USED IN SEPTIC AKI CASES:

RRT	SEVERITY OF SEPSIS			Total
	Moderate	Severe	Shock	
Conservative Management	18	4	3	25
Haemodialysis	1	7	4	12
Peritoneal dialysis	1	8	4	13
Total	20	19	11	50



OLIGURIC AKI AND NON-OLIGURIC AKI MORTALITY ASSESSMENT:

Oliguria	Outcome			Total
	CKD	Expired	Recovered	
No (Non-Oliguric)	7	1	14	22
Yes (Oliguric)	4	19	5	28



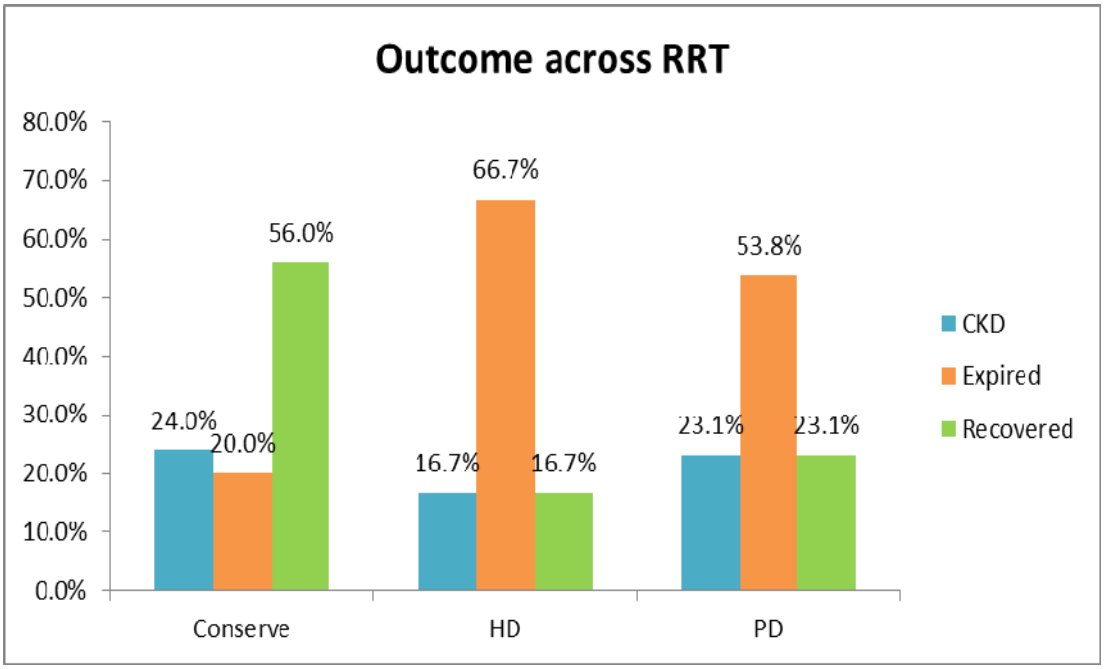
Chi-Square Tests

	Value	df	P-value
Pearson Chi-Square	20.862	2	.000
N of Valid Cases	50		

As per above evaluation, Acute kidney injury in septic patients with oliguria has increased than non-oliguric AKI (p value<0.0001)

RRT AND ITS OUTCOME

RRT	Outcome			Total	%
	CKD	Expired	Recovered		
Conservative Management	6	5	14	25	50%
Haemodialysis	2	8	2	12	24%
Peritoneal dialysis	3	7	3	13	26%



Chi-Square Tests

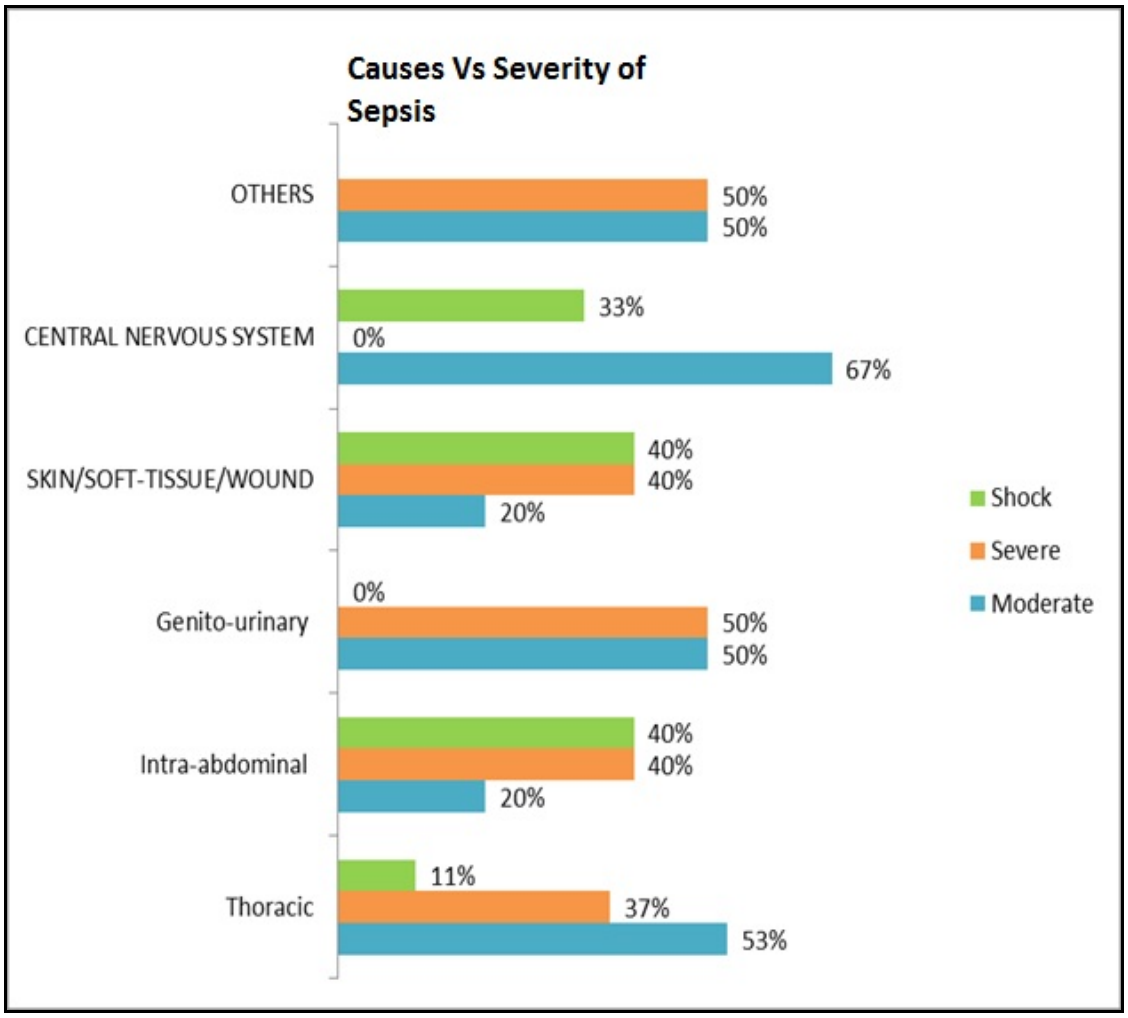
	Value	df	P-value
Pearson Chi-Squar	9.795	4	.044
N of Valid Cases	50		

CAUSE OF SEPSIS WITH AKI

Causes	percentage
1. Thoracic	38%
2. Intra-abdominal	30%
3. Genito-urinary	12%
4. Skin/soft-tissue/wounds	10%
5. Central nervous system	6%
6. Others	4%

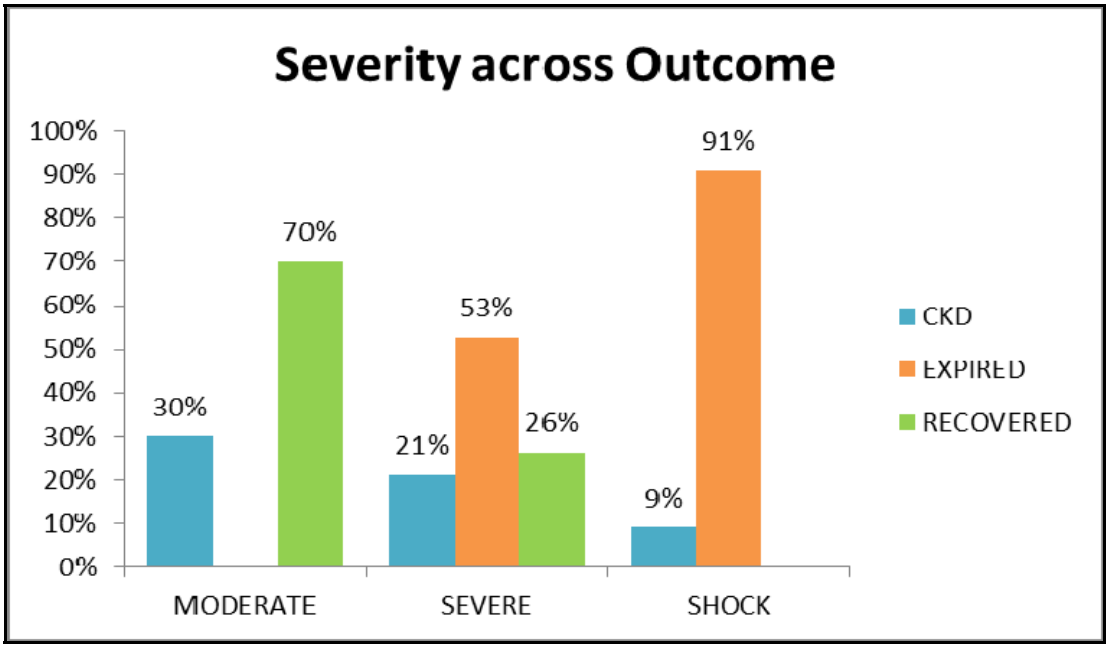
CAUSE OF SEPSIS VERSUS SEVERITY OF SEPSIS

SEPSIS (Severity)	**Cause of sepsis**					
	Thoracic	**Intra-abdominal**	**Genito-urinary**	**Skin/soft tissue**	**CNS**	**Others**
Moderate	10	3	3	1	2	1
Severe	7	6	3	2	0	1
Shock	2	6	0	2	1	0



SEVERITY OF SEPSIS VERSUS OUTCOME

Outcome	Severity of Sepsis			Total	%
	Moderate	Severe	Shock		
Recovered	14	5	0	19	38
% within sepsis	70%	26.3%	0%		
CKD	6	4	1	11	22
% within sepsis	30%	36.4%	9.1%		
Expired	0	10	10	20	40
% within sepsis	0%	52.6%	90.9%		



Chi-Square Tests

	Value	df	P-value
Pearson Chi-Square	27.560	4	.000
N of Valid Cases	50		

Septic shock cases have 90% mortality, followed by 53% mortality seen in severe sepsis. 70% of cases recovered in moderated sepsis and 26% cases recovered from severe sepsis.30% of cases landed up in developing CKD in moderate sepsis and 21% in severe sepsis. Mortality rate increases with severity of sepsis (p value <0.0001)

DISCUSSION

Sepsis is one of the most important causes of In-hospital mortality. The mortality rate goes higher when there is association with acute kidney injury and failure. Though, there are western studies and articles to quote this, studies in India are lacking. The prognosis also depends upon the number of organs involved in dysfunction, mechanical ventilation, age, sex, severity of sepsis and co-morbid states. Mortality in sepsis is varying from one study group to other and as quoted by H Neveu *et al*[6], Mortality ranges from 55 to 89%[6]. Here, we analysis other western studies to our findings.

Sex distribution as per our study, males predominate by 58% and females by 42%.

Studies	Males (%)	Females (%)	Mean age
Sean M Bagshaw *et al*[8]	61.9%	38.1%	58.6
H.Neveu *et al*[6]	59%	41%	62.2
Jose Antonio lopes *et al*[7]	56%	44%	61.8
Our study	58%	42%	51.1

Those three studies studied in large group of patients also demonstrated the male preponderance and the mean age in our study was 51.1 which is lower than those three studies.

Neveu *et al*[6], grouped the septic patients into septic syndrome and septic shock and demonstrated the profile of this patients with acute kidney injury. He demonstrated, septic patients with older age group have higher mortality than the control group[6]. We have also demonstrated that with increasing the age, there is also increase in mortality. This idea was also shared by jose Antonio lopes *et al*[7], in his study he classified the renal impairment cases into risk, injury, failure based on RIFLE classification. In this study, mean age for risk, injury, failure are 61.9, 61.6, 61.8 respectively[7]. Age versus mortality was 27.3% in risk, 28.6% in injury and 55% in failure group[7]. This clearly depicts that with increasing age there is an increase in mortality. Regarding the sex distribution, these three studies clearly depicts male sex are more likely to be affected by septic AKI than females. But, search of articles revealed another study done by Bagshaw *et al*[8], posted in critical care medicine journal states female preponderance, old age and associated with co-morbidities have increased mortality. Lopes et

al[7], has demonstrated old age patients have septic shock when compared to sepsis syndrome patients. This correlates with our study.

Oliguria and septic AKI are well correlated in Bagshaw *et al*[8] and in Neneu *et al*[6], which also demonstrated that oliguric AKI has higher mortality than non-oliguric AKI. They have also demonstrated that oliguria is more common in septic AKI than Non-septic AKI. In our study, 56% of cases have oliguria and 44 % have non-oliguric Septic AKI. Oliguric septic AKI is associated with 95% mortality rate.

Regarding renal replacement therapy in septic AKI, continuous renal replacement therapy versus intermittent haemodialysis is still a controversial one. Bagshaw *et al* (2008;JAMA), concluded by saying continuous renal replacement therapy is ideal choice but pannu et al, gave contradictory reports claiming that intermittent renal replacement therapy is more cost effective and decreases over all mortality. But, in our setting due to financial restrictions only intermittent renal replacement therapy is available. With our limited available of resources, intermittent haemodialysis and peritoneal dialysis in special cases and those who present with moderate sepsis with adequate urine output are managed conservatively. In our study, totally 50% are managed conservatively, 24% by haemodialysis and 26% by peritoneal

dialysis. We observed that patients requiring replacement therapy have higher mortality than the conservative group, however the patients in intervention group are ideal candidates for RRT, which composites of septic shock and severe septic patients (p value <0.04). This view was supported by H.Neveu *et al*, demonstrated mortality more in dialysed group (82.4%) than non-dialysed groups (59%)(p value <0.01). He also demonstrated continuous RRT (86.7%) has higher mortality than intermittent RRT (81.4%)(p value <0.01). bagshaw et al, demonstrated that with septic AKI continuous RRT was followed and in Non-septic AKI intermittent RRT was followed and both groups failed to produce any significance.

Etiological factors for sepsis is also studied by bagshaw *et al*, Neveu *et al* and Hoste *et al*[12], there were no major different ideas. Thoracic causes contributing to major portion of septic AKI followed by abdominal causes. Hoste *et al*[12], demonstrated lung infection (60%), abdominal infection (20%) and others (20%). Bagshaw *et al*, demonstrated, thoracic (30%), abdominal (24.3%), endovascular (6.7%), haematological/ oncological/ immunocompromised (5.8%), genito-urinary (4.1%), skin (3.5%), CNS causes (1.4%) and others (0.8%). In our study, causes of sepsis include Thoracic (38%), intra-abdominal

(30%), genito- urinary (12%), skin/soft-tissue and wounds (10%), CNS (6%) and others (4%). Thoracic causes predominate in these two studies, seen in our study also. Associated co-morbid illness like chronic respiratory insufficiency is demonstrated in those patients with Septic AKI.

Sepsis with AKI mortality is assessed with non-septic AKI mortality in Neveu et al, demonstrated septic AKI has 74.5% in hospital mortality and 89.2% in septic AKI cases with ICU admission mortality. It also, demonstrated ICU admission with septic AKI has increased mortality than hospital admission septic AKI.

Bagshaw *et al*, also demonstrated 78% mortality in septic shock, 55% in severe sepsis cases. These studies demonstrate that sepsis is associated with increased mortality than non-septic AKI cases. These results are also collaborating, with our study demonstrating 90% mortality in septic shock, 52.5% in severe sepsis cases.

Sepsis with AKI is also associated with increase in heart rate, increase in serum billurubin levels, increase in white cell count, low GCS status. Bagshaw *et al*[8], neveu *et al*[6] and hoste et al[12], all these studies demonstrated good significant values. These values are also

demonstrable in our studies. The need for mechanical ventilation is also associated with adverse outcome as demonstrated by bagshaw et al.

Regarding the outcome, the patients are observed for 3 months in Nephrology OPD to determine the progression to CKD and complete recovery.

CONCLUSION

Sepsis is an independent predictor of mortality in patients admitted in both wards and ICU. The mortality is further increased when acute renal injury settles in. Sepsis with acute kidney injury has high mortality in old age patients than younger patients. Male patients have high mortality than female patients. Septic shock and severe sepsis is associated with high mortality than moderate sepsis. Regarding renal replacement therapy, controversy prevails between continuous renal replacement therapy and intermittent renal replacement therapy for sepsis with acute kidney injury patients. However, we studied using intermittent haemodialysis and peritoneal dialysis. We had increased mortality with haemodialysis than peritoneal dialysis. Severe sepsis patients and septic shock patients with AKI are usually managed with interventional therapies. Moderate sepsis patients have good urine output, so they are managed conservatively and their general outcome is good. Oliguric septic AKI is also associated with high mortality than non-oliguric AKI, we need more randomised controlled trials to confirm this.

The pro-forma

NAME:

AGE/SEX:

IP NO:

ADDRESS:

OOCUPATION:

PHONE NO:

DURATION OF STAY:

OUTCOME:

DIAGNOSIS:

CHIEF COMPLAINTS:

H/O PRESENTING ILLNESS:

PAST H/O:

DRUG H/O:

DM SHT CAD CKD

PERSONAL H/O:

ALCOHOL SMOKING DRUG ABUSE

ANTHROPOMETRY

WT: HT: BMI:

GENERAL EXAMINATION:

CONSIOUS LEVEL AT PRESENTATION (GCS):

PALLOR CYANOSIS CLUBBING ICTERUS PEDAL EDEMA

HYDRATION STATUS:

L/E:

VITALS:

BP: PR: TEMP: RR: GCS:

INVESTIGATIONS:

CBC: URINE R/E:

PHERIPHERAL SMEAR: SERUM LACTATE:

MP/MF: ABG:

TOXIC GRANULATIONS:

IMMATURE BAND FORMS (WBC):

OTHERS:

URINE C/S: PUS C/S:

BLOOD C/S:

URINE SPOT PCR:

SEROLOGICAL TESTS AND OTHER TESTS:

RENAL FUNCTION TESTS:

DATE							
S.UREA							
S.CREAT							
INPUT							
OUTPUT							
TOTAL COUNT							

LIVER FUNCTION TESTS:

Date			
Sr.billurbin			
SGOT			
SGPT			
SAP			
Sr.protein(A/G)			
PT			

IMAGING STUDIES:

CXR:

USG ABDOMEN:

CT ABDOMEN:

OTHERS:

RIFLE CRITERIA FOR ACUTE KIDNEY INJURY

	GFR Criteria	Urine output Criteria	Conclusion
Risk	Increased cr×1.5 or GFR>25% decrease or absolute increase in sr.cr of 0.3mg/dl	<5ml/kg/hr for 6hrs	
Injury	**Increased cr×2 or GFR >50% decrease**	**<5ml/kg/hr×12hrs**	
Failure	Increased cr×3 or GFR>75% decrease or sr cr>4mg/dl	<3ml/kg/hr×12hrs or anuria for 12 hrs	
Loss	Persistent AKI >4 Weeks		
ESRD	>3months		

SEPSIS CRITERIA

	Observed	Inference
Sepsis: 1.Temp>38deg cel or <36deg cel 2.heart rate>90/mt 3.RR>24/mt 4.wbc count >12000 or < 4000cell/cu.mm 5.immature band forms Evidence of infection		
Severe sepsis: Sepsis + One organ dysfunction 1.CVS-- SBP <90mmhg or MAP<70mmhg responds to IVF 2.RENAL—UO<5ml/kg/hr despite IVF 3.haematological—plt count<80,000/l or 50% reduction from previous value for the past 3 days 4.unexplained metabolic acidosis 5.adequete fluid resuscitation		
Septic shock: sepsis with hypotension SBP<90mmhg or MAP<70mmhg despite adequate fluid resuscitation and inotropes.		

OUTCOME

Dialysis requiring	**Non-dialysis requiring(conservative management)**

Figure 1 Patient undergoing Haemodialysis

Figure 2 Haemodialysis machine in Nephrology Department

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NAME	AGE/SEX	IP NO	DURATION	CAUSE OF SEPSIS	RIFLE	SEPSIS	OLIGURIC	SBP	HR	GCS	S.billurubin	TOTAL COUNTS	RRT	OUTCOME
Asirvatham	63/M	20456	20	UTI	INJURY	MODERATE	NO	110	112	15	1	11,100	HD	CKD
Selvi	28/F	23902	26	PUPERAL SEPSIS	FAILURE	SHOCK	YES	90	132	12	2.1	12,300	HD	EXPIRED
Suresh	17/M	21097	15	APPENDIX ABCESS	INJURY	MODERATE	NO	120	124	14	1.3	10,800	CONSERVE	RECOVERED
Arasu	59/M	19865	21	PNEUMONIA	INJURY	SEVERE	YES	100	115	12	1.8	11,250	PD	CKD
Shanthi	65/F	19546	28	CVA/BEDSORES	FAILURE	SHOCK	YES	80	115	9	1.4	12,015	PD	EXPIRED
Arulraj	62/M	22976	18	PNEUMONIA	FAILURE	SEVERE	NO	115	124	11	1.2	11,820	CONSERVE	CKD
Rekha	53/F	21087	22	ACU.CHOLECYSTITIS	INJURY	MODERATE	NO	130	124	15	3.1	13,250	CONSERVE	RECOVERED
Ranganathan	44/M	23765	18	LUNG ABCESS	INJURY	MODERATE	NO	128	124	15	1.5	10,250	CONSERVE	RECOVERED
Ponraj	57/M	23128	22	EMPYEMA	INJURY	MODERATE	NO	125	112	15	1.5	10,800	CONSERVE	RECOVERED
Paul	61/M	23671	19	LIVER ABCESS	FAILURE	SHOCK	YES	92	130	13	2.2	11,235	HD	EXPIRED
Antony	33/M	19831	18	DCLD/SBP	INJURY	SEVERE	YES	98	121	12	3.4	11,150	HD	RECOVERED
Vijay	29/M	19429	26	PYELONEPHRITIS/HIV	INJURY	SEVERE	YES	90	122	14	1.5	12,300	CONSERVE	EXPIRED
Santhanam	38/M	19476	15	MENIGITIS	INJURY	MODERATE	NO	112	110	15	0.8	11,015	CONSERVE	RECOVERED
Vanitha	71/F	18743	14	PNEUMONIA	INJURY	SEVERE	YES	92	129	13	2.3	12,810	PD	EXPIRED
Valli	66/F	18643	13	PNEUMONIA	INJURY	MODERATE	NO	114	111	15	0.9	11,140	CONSERVE	CKD
Durai	58/M	28745	20	DM ULCER	INJURY	MODERATE	NO	110	112	15	0.8	10,500	CONSERVE	CKD
palani	52/M	18763	14	LUNG ABCESS	INJURY	MODERATE	YES	120	104	15	1.3	10,200	PD	RECOVERED
begum	64/F	19845	19	MENIGITIS	FAILURE	SHOCK	YES	90	129	12	1.5	11,800	PD	EXPIRED
selvi	81/F	25432	20	PYELONEPHRITIS	FAILURE	SEVERE	YES	100	124	13	1.4	11,200	HD	EXPIRED
anbu	55/M	21903	21	ILLEAL PERFORATION	INJURY	SHOCK	YES	81	132	11	1.3	12,100	CONSERVE	EXPIRED
rafiq	32/M	20342	17	LIVER ABCESS	INJURY	SEVERE	YES	94	124	10	2.1	12,235	HD	EXPIRED
amirthan	79/M	20032	23	CVA/BEDSORES	FAILURE	SEVERE	NO	100	102	9	1.2	10,390	PD	EXPIRED
amala	51/F	21984	12	CVA/UTI	INJURY	MODERATE	NO	130	100	8	1.3	10,310	CONSERVE	RECOVERED
sathya	29/M	23985	14	UTI/HIV	INJURY	MODERATE	NO	130	102	12	1	9,500	CONSERVE	CKD
mala	35/F	25984	11	LSCS WOUND SEPSIS	FAILURE	SEVERE	YES	90	135	10	2.1	11,500	HD	EXPIRED
jyothi	38/F	21942	21	LSCS WOUND SEPSIS	INJURY	MODERATE	NO	120	120	15	0.7	11,000	CONSERVE	RECOVERED
basha	42/M	21958	19	ENCEPHALITIS	INJURY	MODERATE	NO	120	100	11	0.7	10,200	CONSERVE	CKD
subramani	53/M	21748	18	PNEUMONIA	INJURY	MODERATE	NO	110	104	15	1.2	10,302	CONSERVE	RECOVERED
asairaj	69/M	24953	12	PNEUMONIA	INJURY	SEVERE	YES	102	105	11	1.5	12,800	PD	EXPIRED
christopher	62/M	21940	14	EMPYEMA	INJURY	MODERATE	NO	110	102	15	1	11,100	CONSERVE	CKD
elizabeth	42/F	18734	13	PYELONEPHRITIS	INJURY	SEVERE	YES	100	115	11	1.2	11,300	HD	CKD
kamala	66/F	18721	11	ACU.CHOLECYSTITIS	FAILURE	SHOCK	YES	90	113	13	1.4	13,000	HD	EXPIRED
Arul	57/M	18943	10	PNEUMONIA	INJURY	MODERATE	NO	120	100	15	1.2	10,500	CONSERVE	RECOVERED
selva	52/M	18745	19	PERITONITIS	FAILURE	SHOCK	YES	93	130	12	1.4	12,500	CONSERVE	EXPIRED
christy	62/F	19345	14	PERITONITIS	FAILURE	SEVERE	YES	100	129	10	1.5	13,150	CONSERVE	EXPIRED
ezhilvizhi	84/F	19245	21	PNEUMONIA	FAILURE	SEVERE	YES	98	132	12	1.4	11,015	PD	EXPIRED
thamaraikani	73/F	17453	22	DCLD/SBP	FAILURE	SEVERE	NO	103	135	10	3.2	10,500	CONSERVE	RECOVERED
reshma	29/F	23092	12	VSD/IE	INJURY	MODERATE	NO	110	122	15	1.2	11,000	CONSERVE	RECOVERED
razia	68/F	14973	21	PNEUMONIA	INJURY	MODERATE	NO	125	122	15	0.8	11,000	CONSERVE	RECOVERED
rani	56/F	23956	22	PNEUMONIA	FAILURE	SEVERE	YES	95	121	12	1.2	12,250	PD	RECOVERED
sekar	59/M	27635	14	DM ULCER	FAILURE	SEVERE	YES	100	131	14	0.8	13,550	PD	CKD
mohammed	61/M	29834	21	LUNG ABCESS	FAILURE	SHOCK	YES	94	135	12	1.5	12,500	PD	EXPIRED
malar	58/M	25693	20	VSD/IE	INJURY	SEVERE	YES	80	132	14	1.5	11,000	HD	RECOVERED
john	70/M	24780	19	EMPYEMA	INJURY	MODERATE	NO	110	110	15	1.2	11,015	CONSERVE	RECOVERED
chinna	68/M	24863	19	PNEUMONIA	INJURY	MODERATE	NO	129	105	15	1.1	10,900	CONSERVE	RECOVERED
muthu	66/M	27834	13	ILLEAL PERFORATION	FAILURE	SHOCK	YES	85	132	11	1.4	13,500	CONSERVE	EXPIRED
rabia	35/F	21053	13	EMPYEMA	INJURY	SEVERE	YES	105	134	13	1.1	12,850	PD	RECOVERED
begum	36/F	27463	14	DM ULCER	FAILURE	SHOCK	YES	90	129	10	1	11,500	PD	CKD
joseph	42/M	21749	21	DCLD/SBP	INJURY	SEVERE	YES	92	129	12	1.1	10,500	HD	EXPIRED
rajathi	53/F	21749	21	PNEUMONIA	FAILURE	SHOCK	YES	90	123	10	1.5	11,540	HD	EXPIRED